# solplan review

the independent newsletter of energy efficient building practice

**the drawing-room graphic services ltd.**
box 86627 north vancouver b.c. V7L 4L2

No. 9 June - July 1986

## INSIDE....

Ventilation is the most important feature of low energy housing. Balancing the system requires proper design as well as knowing how to do it. An improperly designed and installed system can be as bad as not having any.

In this issue we review just what is meant by balancing an HRV, how it is done, and what kind of instruments are used.

Fireplaces are favoured by homeowners - not for their energy features but for the aesthetics. Masonry fireplaces don't have to be liabilities. We present a series of details that can be used to keep the building envelope air tight around masonry.

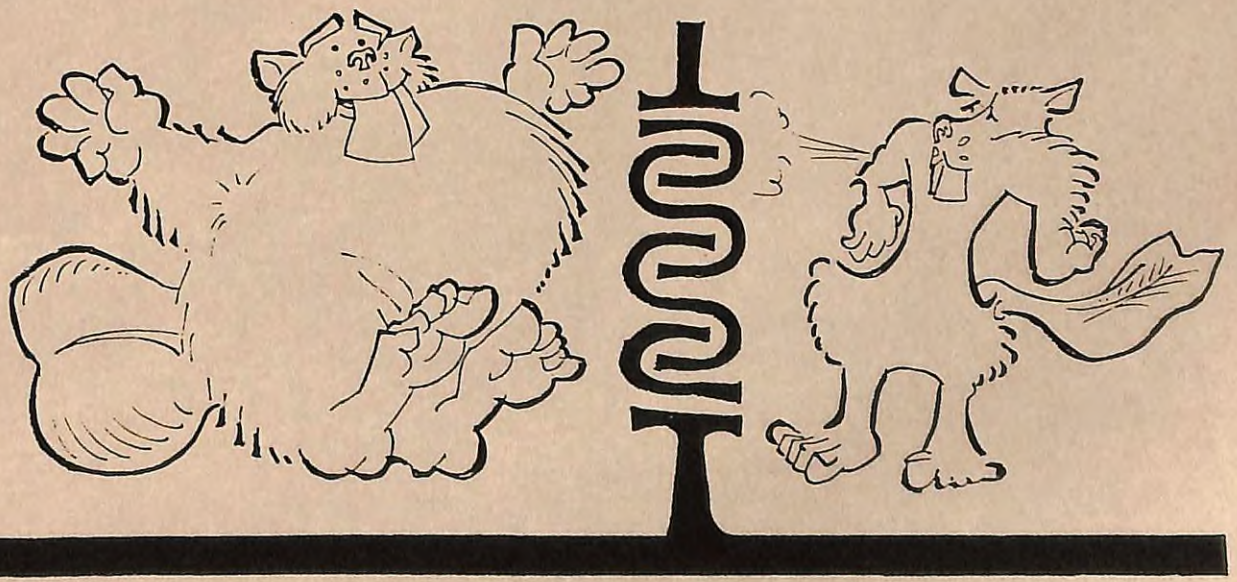
Indoor pools and spas are seen more frequently - in our climate, if you invest in them, it makes sense to get the maximum benefit! But a poorly constructed enclosure can lead to catastrophic results. We review points that should be considered when building an indoor pool.

Warranties on renovation work are going to be tried in Alberta. This promises to be a powerful marketing tool to the industry if succesful.

Other items include the announcement of the retirement of a pioneer building scientist in Saskatchewang; EMR's response to our commentary on ventilation requirements; a new radiant heating panel; LEBCO commentary, and news.

## CONTENTS

Air-Changer Co. Changes Hands . . . . . 2
Balancing HRV's . . . . . 3
Warranties for Renovations . . . . . 6
Orr Retires . . . . . 6
Energy Efficient Fireplace Design . . . 7
Indoor Pool Design Considerations . . . 9
Letters to the Editor . . . . . 11
Update: on R-2000 funding . . . . . 13
Update: How Much Ventilation Is Enough. 13
New Products: Therma-Ray Panels . . . . 14
LEBCO News . . . . . 15



## FROM THE PUBLISHER

It is often stated that life is stranger than fiction. How many stories are not written or made into movies because they are considered too far fetched, only to happen in the real world?

In the last issue we focused our attention on an issue of growing concern - a radioactive contaminant in houses: environmental radon emmisions that can build up in houses to potentially unsafe levels.

As fate would have it, the day we took the last issue of SOLPLAN REVIEW to the printer, an accident occured in a place no one had heard of but which is now a household name. The fallout from Chernobyl is much more serious and disturbing than anything we could contemplate. But the accident only underlines that anything we create can have major impacts where we least expect it.

By comparison, the consequences of an improperly constructed house are insignificant. But too often, innocent activities can have significant consequences that we cannot contemplate. It's certain that a disaster on the scale of Chernobyl will not happen as a result of an improperly built house. But to the homeowner, suffering a poorly built house, it is a major issue.

The homeowner is entitled to be assured that his new house be as safe a home for his family as is possible. It is for this reason that we encourage continued research that will help builders avoid future problems.

Richard Kadulski
Publisher

## NEW AT AIR-CHANGER CO.

AIR-CHANGER CHANGES HANDS AGAIN

Clawsey-Sohrt Mfg. Ltd. has announced that it has acquired the Air Changer Division of Nortron Industries Ltd.

Clawsey-Sohrt Ltd. has been manufacturing the Air Changer equipment for the past four years. Clawsey-Sohrt manufactures a complete line of gas and oil residential and commercial warm air heaters as well as humidifiers and commercial boilers.

Dara Bowser will continue to be responsible for the product line.

Sales and service will continue to be provided from the Toronto area at:

Air Changer Division
Clawsey-Sohrt Mfg. Co. Ltd.
7290 Torbram Rd. Unit #14
Mississauga, Ont. L4T 3Y8
(416)-673-0667

## OUR NEW LOOK

If you've noted a new look to this issue, you're correct. During the past month we've been learning how to take advantage of a new tool: an IBM-AT clone computer. As we become more familiar with the technology, it will help us to put together a better publication - not to mention make it easier to handle our library and data files.

When we figure out how to use it, the spelling checker will (hopefully) mean that there may a few less spelling misteaks.

We still have a lot to learn about this machine (it took us only month to find out how to turn it on!).

SOLPLAN REVIEW is published 6 times per year by The Drawing-Room Graphic Services Ltd. P.O. Box 86627, North Vancouver, B.C. V7L 4L2. Tel: 604-689-1841
ISSN: 0828-6574

COPYRIGHT 1986 by The Drawing-Room Graphic Services Ltd. All rights reserved. Reproduction without written permission of the publisher is strictly forbidden. Transgressors note: the Wrath of Khan will be let loose on those who don't take heed!

SOLPLAN is a registered trademark of The Drawing-Room Graphic Services Ltd.

SUBSCRIPTIONS: $24.00 per year in North American. Overseas rates on request.

Unsolicited contributions and manuscripts welcome. Include self addressed pre-stamped mailer if return requested, Publisher is not responsible for loss or damage of same.

Second Class Mail Registration No. 6855

Date of Issue: July 1986



## BALANCING A HEAT RECOVERY VENTILATOR

The significant element in a low energy house is the mechanical ventilation system. It ensures that the house receives adequate fresh air for indoor health and comfort.

Fresh air can be supplied in a number of ways. The most commonly used involves heat recovery ventilators. The HRV's prewarm fresh air by recovering heat from the exhaust air.

Standards have now been developed to define the proper installation and operation of HRV's. The R-2000 Program requires that if an HRV is used, it be balanced.

What exactly does balancing an HRV mean? How is this achieved?

When a system is balanced, it means the house ventilation system operates to equalize the pressures in the house. An equal or neutral pressure across the house means that pressures inside and outside will be equal - so that if a window or door is opened, no air would flow in or out, (unlike a baloon which has a greater pressure inside than outside).

In the R-2000 program, the installer must be certified by the HRAI (Heating Refrigeration and Air Conditioning Institute), have attended an installer's course and be familiar with the proper operation and balancing of a good installation.

However, as in all things, not everyone is equaly competent. Tradesmen new to the equipment may have some problems. 90% of the first group of R-2000 houses in Canada had unbalanced ventilation systems.

When the HRV's leave the factory, the fans in the unit generally are in balance. But when the unit is installed with ductwork in a house, the friction of air against the duct walls, elbows, and joints reduces the actual air flow. Variable duct arrangements create more or less restrictions (also known as duct losses) which lead to reduced air flows.

There are 2 ways of distributing air - by means of ducts directly from the HRV or through the duct system of a fresh air heating system - although if the hot air furnace system is used, a gap of 6-12" must be maintained between the furnace return air duct and the HRV air supply. This gap avoids the furnace from overpowering the HRV fans.

Typically, exhaust ducting tends to be much shorter than the supply side, so that the two fans face different pressure conditions. Unless some sort of adjustement is made, the exhaust side will actualy move more air than the supply air flow which faces more restrictions. As a result, unbalanced air flows are created, and the house could be put under negative pressure.

New R-2000 technical criteria require a system designed to provide 10 cfm for each room in the house. This is a theoretical requirement, and allows for some control with individual room difussers. The technical criteria do not specify that the system must actualy distribute that much to each individual room. The balancing that is called for is the pressure difference between the inside and outside of the building - not a room by room balancing of air flows.

The balancing compares the volumes of air going into the house (the supply air flow) to the volume of air going out of the house (the exhaust air flow). For a balanced system, the two air flows must be equal.

The fans used in an HRV generally have an equal capacity when they leave the factory. However installed in a house with whatever ductwork is required, the friction of air against the duct walls, elbows, and joints reduces the air flow. How significant are duct losses? A poorly designed layout could have so many restrictions that no air is available at the end!

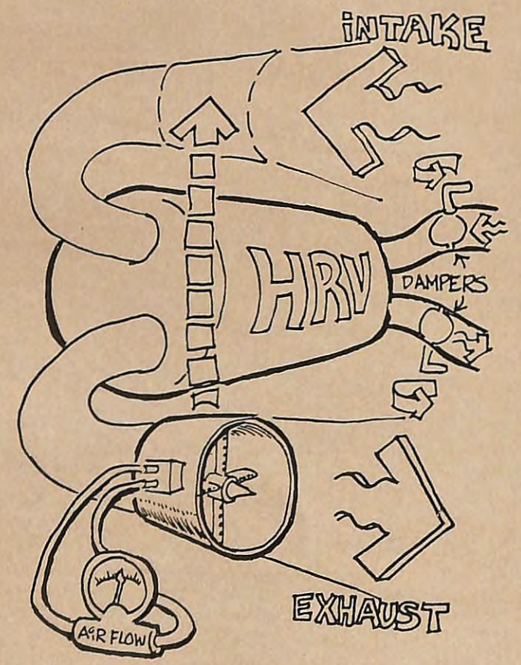
THE EUROPEAN APPROACH TO BALANCING HRV'S

Proper balancing can be achieved by one of two methods. The European approach is to do a careful duct design, sizing each duct and elbow. By calculation, total duct losses and air flows are established. The exhausting fan draws air through an equivalent length of duct system, to match that of the supply fans. In other words, just enough extra friction is built into the system to balance that of the supply air.

THE CANADIAN APPROACH

The Canadian approach is to design a proper layout, but rather than adding extra friction to match that created in the supply side of the layout, the friction on one side of the HRV is modified by adding dampers. The dampers are opened or closed partially (as needed) to create the required constriction that matches.

The ideal duct layout is one that has a minimum of turbulence sources. Each elbow,




piece of flex duct, joint, tee creates a restriction.

A well designed system will require little corrective balancing, as a good ductwork system provides inherent balancing.

However, if not all goes according to plan, and some corrective action needs to be taken, what next?

The first step is to make sure that the system is roughly in balance (between incoming & outgoing air flows).

Exhaust balance: With exterior hoods and cold end ducts installed (but before interior grills are mounted), the HRV on high speed should draw approximately equal air flow from each exhaust point.

Fresh Air blance: Similar to exhaust, except that air will be supplied to the duct openings rather than drawn from the ducts.

Total system balance: with the unit at a high speed, and all interior grills mounted and open, the total exhaust and fresh air flows should be equalled.

A proper test can be done any time that all the ductwork is in place. The HRV unit must be complete, with all filters and registers in the operating positions.

Air flows are measured on the warm side ducts of the system.

If the supply and exhaust air flows are not equal, the system must be balanced. The larger air flow must be reduced by adjusting the balance damper in the duct until the flows are balanced within 10% of each other.

INSTRUMENTS FOR MEASURING AIR FLOWS

A number of instruments are used to measure air flows.

The simplest test (good for two storey houses) can be done with no special equipment. It requires opening one window (located half-way between the lowest floor and the highest ceiling of the heated shell) on a mild calm day. Imbalance of air flows is indicated by a small draft entering or exiting from the window. This can be detected by looking at the smoke from a cigarete, or hanging piece of tissue or kitchen wrap in front of the window.

No movement indicates the house air flows are reasonably balanced. If movement is outward, the house is pressurised possitively. If movement is inward, the house is negatively pressurised.

Efforts should be made to minimize the draft by partially dampering one of the fresh or exhaust air ducts. This test may be simple, but will work only on a very tight, chimney-less house. Accuracy? ± 100%

This test can be reasonably accurate in buildings with higher air flow rates. Low cfm system have such subtle airflows that they can't be easily observed with this kind of test.

THE PLASTIC TRASH BAG

The next test can be done with a plastic trash bag. A trash bag is quickly placed over the exhaust hood and held tightly against the wall. The time to fill the bag are measured. The bag is then taken inside the house, the bag is placed over the supply duct, and once again the time to fill the bag measured.

Accuracy? ± 100%

THE THERMOMETER

A reasonably accurate measure of the air flow balance can be judged by measuring the temperature difference in the air streams as they go through the HRV. The temperature drop should be identical for both flows in order for the system to be in balance.

This test can only be done during cool weather - when the temperature difference between inside and outside is high enough to be measurable. While accurate, this test requires a considerable amount of time to ensure that the thermometer has registered a constant temperature.

These tests are adequate to provide a very rough indication of how the system is performing. They are cheap, but not accurate. They are not recommended except in the most dire of circumstances.

Generally, any of a number of instruments can be used, ranging in price from a few hundred to several thousand dollars each. Some of these include the following:

THE HOT WIRE ANEMOMETER

This has a heated element mounted on the end of a probe which is inserted into the air stream through a small hole into a straight section of duct whose length is 10 times the duct diameter. (i.e. for a 6" duct, you need a 60" section).

The hot wire anemometer measures the absolute flow rate, which can be converted into cubic feet per minute. This is a compact instrument that requires only a small hole in the duct, and can be used to measure other airflow situations.

Unfortunately, it is a very precise instrument that requires special care and skill to obtain consistent results. Large measuring errors can be obtained if not handled properly.

It can also be expensive - up to $1500.

THE FLOW-CAL

This is a commonly used instrument that is sturdy and easy to use. A short section of duct is replaced by a pressure grid mounted in a metal sleeve. It measures the average velocity of air through the duct. The pressure is obtained by a magnahelix gauge - these readings can be converted into cfm.

This is a compact unit that requires no holes in the ducts, and inexperienced users can obtain highly accurate results with very little training. It is accurate to within ±4%.

It costs about $200-400.

PITOT TUBE AND PRESSURE GAUGE

A pitot tube is inserted through a small hole into a straight section of duct whose length is 10 times the duct diameter. (i.e. for a 6" duct, you need a 60" section).

Several pressure readings from different cross-sectional areas of the duct are taken and averaged. The cfm rate is obtained from conversion tables.

This equipment requires care, as unskilled users can obtain very inaccurate readings.

The cost is $200-400.

INCLINED MANOMETER

This is an instrument that uses a fluid to measure pressure differentials. It is very accurate (to within ±1%). It is relatively easy to use, but requires some care and attention - perhaps more than most tools on the job site. If slung around the job site with abandon, it will get damaged.

This is the instrument that is being recommended for use now because of its accuracy.

The cost is about $200-400.

Because of the relatively low airflows involved in residential ventilation systems, it is difficult to get accurate airflow measurements. Even a small error is significant, so there is a great deal of concern with the accuracy of test results.

With these instruments, airflows of the inlet/outlet ducts can be determined and compared. Hopefully, both airflows will be close to or exceed the design air flows before the balancing procedure starts.

Balancing is required when the difference between the two is more than 10%.

If balancing is needed, the measuring device must be attached to the duct with the greater air flow. The balancing damper in this duct is then slowly adjusted until the pressure reading matches that recorded on the other air stream once the two air flows are balanced, the dampers should be locked into position.

## WARRANTIES FOR RENOVATIONS

A new program to provide warranty protection on residential renovations and retrofitting will be piloted in Alberta this summer. The warranty will cover material and workmanship deficiencies in insulation, air sealing, window and door installation, re-siding and ventilation work.

Homeowners who deal with participating contractors will be protected by up to $5,000 for deficiencies in workmanship or materials for the first two years, up to $5,000 for completion of a project in case of contractor default, and up to $1,000 for out-of-pocket deposits in case of contractor default.

The plan will be administered by a new non-profit Energy Conservation Contractors Warranty Corporation. The insurance fund will be managed by independent outside insurers.

The program will be open to contractors and manufacturers who meet membership prerequisites of financial stability and technical competence. The premium will be about one and one-half to two percent of contract price for each job, and all jobs must be enrolled. The program is expected to be available throughout Canada by the end of 1986.

Unfortunately, the renovation field has been full of questionalbe fly-by-night operators, so this program offers a positive alternative, and a way to deal with the sad reputation of the industry.

The renovation business will become the major growth area in the construction field, as old housing stock must be updated. Many of the houses built during the great post World War II building boom are reaching the age where renovations are needed.

## ORR RETIRES

Harold Orr, the internationally recognized expert in building energy conservation, has announced his retirement from the National Research Council this August. Fortunately, he is not retiring from work, but will join the consulting field - so he's still going to be around to pass on his knowledge.

Harold's accomplishments have been many in the area of low energy housing. They include pioneering work in airtightness details, low energy framing techniques, blower door development, and the HOTCAN computer program.

Since 1962 he has been with the NRC, most of the time at the NRC's Prairie station in Saskatoon, where his activities included research in problems of prairie construction. His involvement with insulation and airtightness issues go a long way before they became fashionable.

It is not often that a research scientist becomes well known outside his field. However, a combination of factors - the energy crisis of 1973, his field experience, and the nature of the NRC, changed that. Harold is assured, opinionated, usually correct - and enjoys talking to people.

Harold became a public figure when the Saskatchewan Conservation House put him in the spotlight. This project started out as a 'solar' house. In the process of its design, the team, of which he was one of the key players, went back to first principles of building science, and concluded that an energy conserving house suitable to Saskatchewan was more appropriate than a purely 'solar' house. The result was the Saskatchewan Conservation House. It represented a breakthrough in the way we look at residential construction for cold climates, and put Canada in the forefront of low energy building across the world.

We look forward to Harold's continuing activity in the low energy building field, but with the pressures of private enterpise, we fear that his voice may not be heard as widely as it could be in his position with at NRC.



# ENERGY EFFICIENT FIREPLACE DESIGN

FIREPLACE DESIGN

The open fireplace once was the only source of heat in our homes. Now, it is mainly an interior design feature that most homeowners want. It is designed to cheer the heart and soul, valued for its aesthetics but not its energy value. In many cases, fireplaces are only used a few times per year at best.

The exact performance of open fireplaces is difficult to determine with any certainty. Generally, the net efficiency of the fireplace is positive when in use (at an efficiency of 10-30%), and a net heat loss when it is not (and the dampers have not been closed) being a generator of drafts.

In low energy houses (or any other house for that matter) fireplaces are a major problem. The major concern is how to seal the fireplace unit, as the building codes require a separation of 2" between combustible material and the fireplace and flue.

IMPROVING FIREPLACE DESIGN

As most people insist on fireplaces, what can be done to improve their efficiency, or at least not make the fireplace a heat sink?

The first, and perhaps most obvious action is to damper the flues. All fireplaces may now be built with dampers. Additional dampers can be installed - such as chimney top dampers and sealed doors on the fireplace opening itself.

Glass doors are now frequently standard on prefabricated factory built units. While the doors reduce heat loss when not in use, many are not completely airtight. Selection of a good quality, tight fitting door is necessary.

The glass used in the doors must be carefully chosen. It can shatter if heated quickly, when subjected to extremely high temperatures, or if a piece of burning wood rolls against it. In addition the door frame design must allow for thermal expansion of the glass.

The best glass is a refractory ceramic glass, although it does reduce radiant heat output. Ideal doors would be those approved for airtight wood stoves.

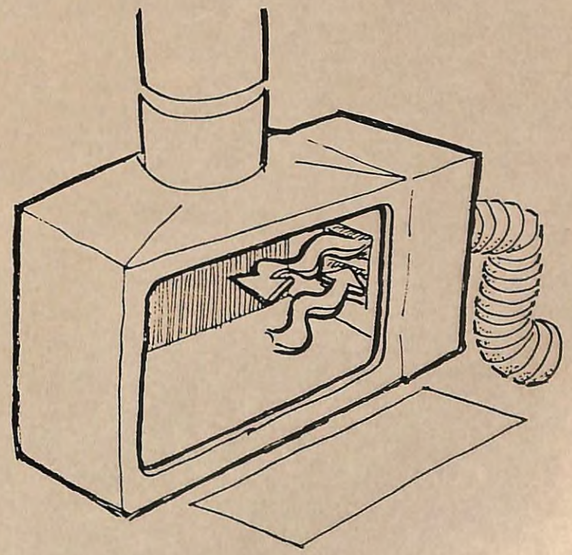
COMBUSTION AIR

All fuel-burning appliances require a supply of air for safe and efficient combustion. This may be a self-evident statement. However, it is a major source of concern in modern tightly sealed houses.

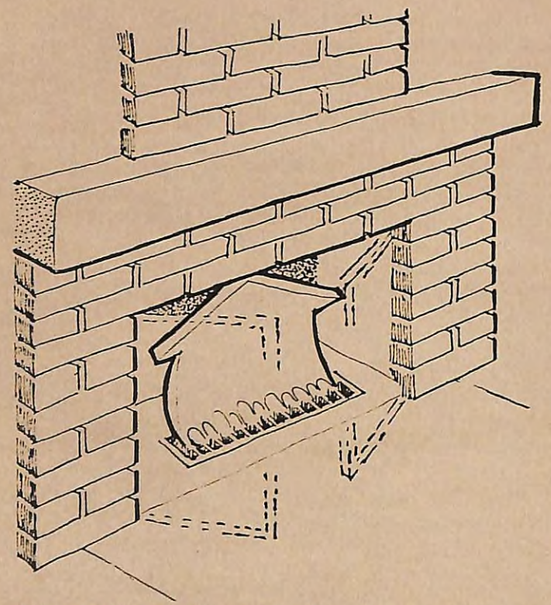
A typical fireplace requires some 250-400 cfm of air for combustion. Any low energy builder will recognize the significance of these numbers - since the typical heat recovery ventilator can supply up to about 220 cfm. This air is required for occupant health and safety, so that the HRV cannot provide the combustion air required. This means that the fireplace must be provided with combustion air directly into the firebox. (This is why the R-2000 program requires that fuel burning combustion appliances be fitted with direct combustion air).

Most prefabricated fireplace units have fresh air kits - in our opinion, they should be a standard item rather than an option.

If selecting a prefabricated unit, the location of the fresh air intake should be considered carefully. Some units have the fresh air supply located high up the side of the firebox. We have heard that there could be a problem with some of these, as



the fresh air intake may be located high enough that the fire cannot draw enough air through it. In some cases, the fire could actualy backdraft out the combustion air duct, leading to a dangerous situation.



The prefered location for the air inlet is at the base of the firebox. This will ensure that air is drawn into the firebox, and will eliminate the possibility of backdrafting out the supply air duct.

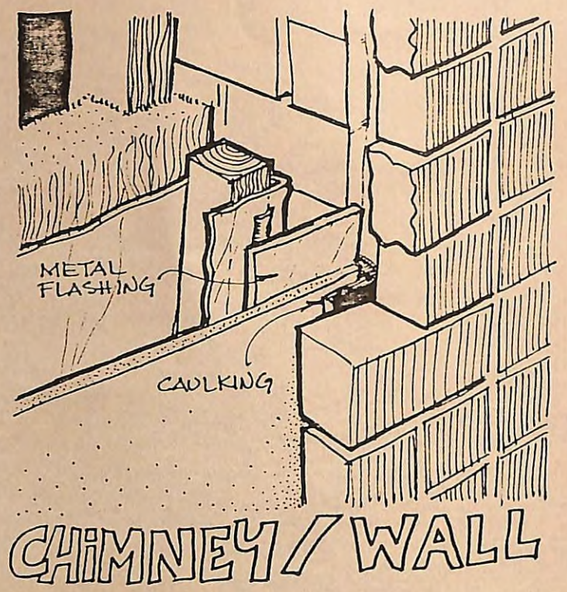
MASONRY FIREPLACES

Prefabricated units are increasingly being used because of their ease of installation, their factory quality control and ease of sealing.

However, there is no reason why masonry fireplaces cannot be built as airtight as a good quality wood stove or 'zero-clearance' fireplace unit.

If the fireplace must be located on an outside wall, the fireplace should be insulated on the outside. If it is not possible to insulate the fireplace masonry on the exterior, or bring the fireplace inside the building envelope, then you want to keep the opening through the building shell as small as possible.

The details we are presenting show flashing details that can be used to seal the gap required by the codes. Properly

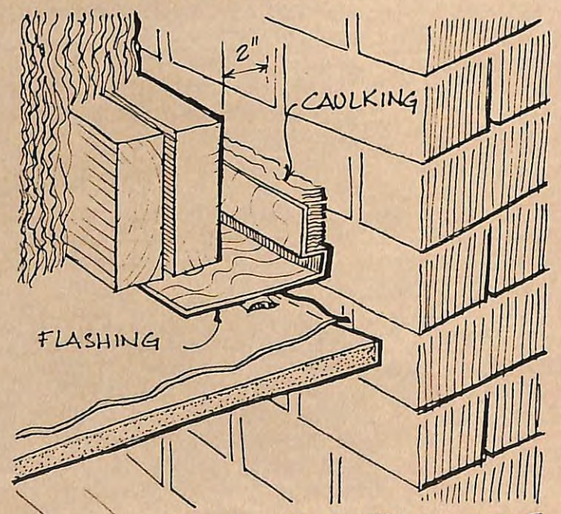



CHIMNEY / WALL

installed they will maintain the integrity of the air barrier of the house.

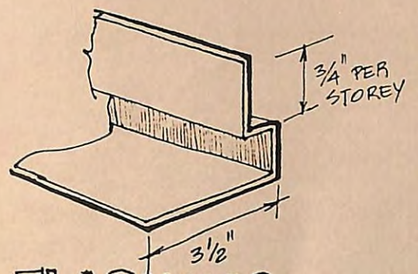
Building codes require that a minimum 2" clearance is maintained between the masonry and combustible construction. This does not mean it is not possible to seal the gap.

The chimney/wall detail applies equally for the fireplace opening header or the sidewall of the fireplace.




CHIMNEY / CEILING






FLASHING

The key is to keep a pocket in the masonry that will allow a flashing and drywall to fit into it. The slot is filled with a caulking bead. The flashing is nailed to the framing only. Any movement of the framing should not break the seal if the caulking remains flexible.

The connection between the chimney and ceiling is kept sealed by using a formed flashing that acts as a pocket for caulking. The flashing is positioned snugly against the masonry, but is nailed to the framing only. The flashing can move with the wood framing, but the caulking bead maintains the seal.

Our bias, if fireplaces must be built, is to use masonry units because of their inherent safety. If they are located on an inside wall they can provide added thermal mass to moderate the temperature swings and store heat generated by the fireplace.

Masonry stoves have been used for a long time in many areas of the world, and still are. A masonry fireplace is not a stove, but at least it has some of the good features of masonry stoves.

These details offer a solution for sealing masonry construction.

(These details were developed by Al Koehli)

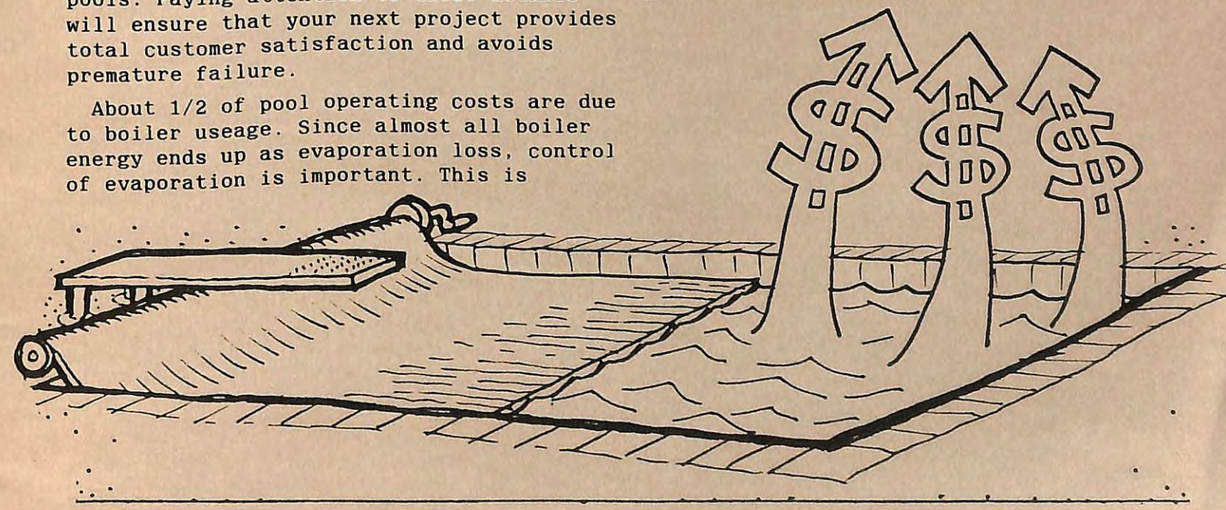
## INDOOR POOLS: DESIGN CONSIDERATIONS

Indoor pools, lap pools, and hot tubs are becoming more common today. However, unless special attention is paid to the detailing and construction the pool rooms will not live up to their owner's expectations, and in fact lead to major problems. In extreme cases serious moisture problems can destroy the building.

We would like to review the key points to consider when building and operating indoor pools. Paying attention to these details will ensure that your next project provides total customer satisfaction and avoids premature failure.

About 1/2 of pool operating costs are due to boiler useage. Since almost all boiler energy ends up as evaporation loss, control of evaporation is important. This is further compounded as ventilation for moisture controls is also much higher when evaporation increases.

Moisture always evaporates from a pool surface. The amount of evaporation depends on the temperature difference between the air temperature and water temperature. The greater the temperature difference the more the evaporation. Even in your bathtub evaporation is greater when the water is hot than when it cools down.



Evaporation is also affected by the relative humidity in the room - it is faster in dry rooms than humid rooms where the moist air of the humid room actually supresses further evaporation.

Since warm air can hold more moisture than cool air, increasing the room temperature will also reduce water evaporation. Why is this important? A standard 16'x32' uncovered pool at 84°F will loose some 75 gallons of water through evaporation from the surface every day!

Control of environmental conditions is critical to control costs, maintain comfort conditions, and avoid problems.

POOL COVERS

The best control of evaporation and humidity is the pool blanket. A well fitting floating cover stops evaporation, effectively arresting the major source of pool water heat loss. This conserves energy, as the boiler can shut down.

Once the water that may collect on top of the cover evaporates, ventilation is not required so that the heat loss on even the most efficient heat recovery system is arrested.

While pool blankets are the most economical humidity control measures, all pools must be uncovered while in use. Some are left uncovered permanently for any number of other reasons.

The succesfull pool is always backed by a team of 4 key players: the building designer, the builder, the mechanical contractor and the owner.

The following points must be checked by the participants to ensure a succesful installation.

THE DESIGNER

The pool room must be completely isolated from the house - even single pane sliding glass doors are fine. Pool decks must be well drained. Mechanical ventilation and heating systems must be designed to allow proper operation. Provisions must be made for a pool cover (even if one is not to be installed immediately).

The pool room should be treated as a totaly separate building when considering mechanical and heating systems (even if they are shared).

THE BUILDER

The room must be 100% airtight. Practically this means sealed recessed fixtures, sealed skylight wells, a room which will meet a blower door test requirements. Outside walls and attics must be thoroughly insulated. Special attention must be paid to vapour barriers.

THE MECHANICAL CONTRACTOR

He should ask the builder or owner these questions:

1. What is the maximum pool water temperature? Is there going to be a hot tub as well as the main pool?
2. What is the surface area of the pools?
3. What is the minimum air temperature the owner will maintain?
4. Will the outside windows be double glazed and have a 1/2" air space (minimum)?
5. Is there enough ventilation provided to maintain a 60% relative humidity? This generally means 1 cfm per square foot of water surface area for 84°F pools, and 2-1/2 cfm per square foot for 104°F pools.
6. Is there sufficient heating capacity for the space (including make up air for heat recovery ventilation) to maintain copmfortable indoor temperatures at minimum operating costs?

THE OWNER

When your pool is uncovered, are you maintaining the temperature as agreed? Here warmer is cheaper!

Optimum design conditions for an indoor pool are:

Pool water temperature ....75°F
Air Temperature .....80°F
Relative humidity.....60%

If these conditions are changed, due to a preference for warmer water temperature, or type of use the pool will get, then the conditions will be altered somewhat. Generally, it is important to maintain the relative humidity of the pool room at such a level that the dewpoint temperature of the air is below that of the inner surface temperature of the exposed walls and ceilings.

We have seen too many pools where someone didn't do their homework and as a result they encountered major problems. Remedial action can be expensive.

Pools can be complex. However, following these basic steps, will go along way to minimizing many of the problems encountered in the field. This will help ensure that your customer enjoys project to its full potential, without too many nasty incidents!



## LETTERS TO THE EDITOR

Letters may have been edited for brevity.

Sir,

I wish to address the concerns expressed in the article on the Habitair Energy Centre in your February-March issue of SOLPLAN REVIEW.

First, I disagree that there would be condensation resulting from high humidity air being brought into the wall cavity.

Looking at climatic data for Vancouver, we find that although the mean relative humidity for December is 90%, the dew point temperature is only 36°F. There would obviously be no condensation as this air meets the 70°F interior and, in fact, the R.H. drops to 30% as the air is heated to 70°F.

While it is true that a Fiberglas System house has an airchange rate of about 2.5 ac/h at 50 Pa, tests have shown that openings are smaller and more uniformly distributed than in a tight house. This is evidenced by depressurization tests which produced a flow exponent of 0.835.

An exponent of 0.70 to 0.75 is more usual in standard tight houses. Note that the higher the exponent, the better the air barrier under normal operating pressure differentials (10 Pa) as opposed to the relatively high figure of 50 Pa used for testing.

Building scientists have concluded that imposed negative pressure counteracts the wind and stack generated pressure, thereby reducing, if not altogether eliminating uncontrolled exfiltration.

Thermographic scans have confirmed the relatively uniform air leakage into Fiberglas test houses.

Thus, the Fiberglas System house does prevent uncontrolled exfiltration while at the same time providing adequate and uniform fresh air distribution.

As for concerns regarding the back-drafting of fireplaces and wood stoves, Fiberglas Canada insists that such devices be supplied with outside combustion air and airtight doors. In addition, the chimney should be an insulated steel type, running through the insulated envelope to ensure that the fireplace enjoys a draft advantage over the house interior.

I hope that I have been able to clear up any misconceptions that may have existed with the Fiberglas System. We believe that we have developed a simpler system that will encourage the more widespread construction of low energy housing.

L.S. Fox, P.Eng.
Supervisor, Technical Services
Fiberglas Canada Inc.

We appreciate the concerns about backdrafting through fireplaces and wood stoves. Airtight glass fireplace doors are obviously a must. Unfortunately, we have not seen many good tightfitting doors to be reassured that a negative pressure will not backdraft through fireplaces.

Our concern about potential radon problems brought about by negative pressures remains, unless special attention is paid to this issue in those areas where radon is a potential problem.

Sir,

I read with interest your April-May 1986 issue and would like to compliment you on your ambitious undertaking of reporting on new developments in the dynamic energy efficient housing industry.

There was one item (LEBCO NEWS) concerning the need for continued support of the R-2000 program, however, that I feel could lead to unrealistic expectations from the program, particularly in the Lower Mainland regions of B.C. The item stated that "conventional R-2000 technology adds about $5000 to the cost of a house, and this additional investment is paid back through energy savings in about 10 years." For this statement to be true, annual savings would have to be $500 on a simple payback basis, and somewhat higher if the value of money (discount rate) is considered. For those using natural gas (the least expensive fuel), these savings would not be possible in an average sized home.

Our studies indicate that a "typical" new 1200 $ft^2$ home with heated basement built to conventional standards (RSI 3.5 (R20) ceilings, RSI 2.1 (R12) walls, double glazed windows) would have a total natural gas energy cost for space and water heating of less that $500/year (there is an additional bi-monthly basic charge of $9.28 but this cannot be saved by reducing energy use). When savings are quoted for R-2000 homes, just what is the standard to which

they are being compared? It would seem that current conventional practice using the lowest cost fuel should be considered the base case.

We at B.C. Hydro support energy efficient housing for the substantial benefits it provides the homeowner and society as a whole, however, we feel that it is important that those providing advice and leadership in the field do not raise expectations beyond what can reasonably be expected to be delivered.

J.M. Bond, P.Eng.
Energy Management Engineer
B.C. Hydro

Our comments are a generalization, which, nevertheless, will stand scrutiny in most parts of Canada - and our readership is cross Canada. The simple payback approach provides a quick and easy view of the potential performance of a house. It may not always match more detailed analysis which can consider the details of a given situation.

R-2000 Program monitoring indicates that an R-2000 house can achieve a positive cash flow within 3 to 5 years (when considering principal, interest, taxes and energy payments). Obviously, the specific situation for a given house will depend on its design, location, and occupant patterns.

We've noted that B.C. Hydro's interest in energy conservation has been manifested by actions recently taken, which include: dropping its participation in he Canadian Electrical Utilities Super Double E program, dropping of its Energy Conservation Division (albeit a much reduced energy management division has remained), increased promotion of energy sales (including an agressive natural gas fireplace sales campaign by its gas sales division), and the lowering of the profile of energy conservation materials that have been produced over the years. Ed

Sir,

We would like to clarify statements made in SOLPLAN REVIEW no. 7 (The Measure of Insulation) that we feel are somewhat inaccurate or incomplete.

We would like to point out that cellulose fibre is a proven material of quality and has been used since the 1920's. You state that insulation is the key element in energy efficient building envelopes. We agree. Weathershield (a cellulose fiber insulation - CFI) behaves as an air barrier, providing high resistance to air movement (air leakage) because of its higher density and hollow fibre structure. Lighter density mineral fibre products provide relatively little resistance to such air infiltration - this is detrimental to R-value stability. In addition, CFI allows little change in R-value over a wide temperature range. This cannot be said for many other insulation materials.

With regard to insulation ratings (R-value), we would like to point out that the R-value claims of light density mineral fibre products are based upon laboratory conditions. These materials are prepared under near ideal conditions (i.e. loose fills at design density, batts properly fitted). Because of the significant effect of air movement and applicator technique (i.e. loose fill density, batt fitting), such R-values are unlikely to be encountered under field conditions. As CFI provides high resistance to these factors, the field value and laboratory value are the same.

You mention field tests for loose-fill glass fibre showing under-insulating potentials. We find that although the problem still exists, it is not as frequently encountered.

With regard to settlement, we would like to point out that cellulose R-value varies little with density. We agree that installed density may vary ±10% as you suggest, but the R-value will not change appreciably for that range. It is misleading to the consumer to make incomplete statements. You do not mention the variability of light density glass fibre installations - as much as 40% less R-value depending upon density and installation technique.

With regard to proper installation, we believe it is important to point out that the problem would be more prevalent with batt insulation - fiting is critical for R-value.

Alvin Ballachay
Canadian Cellulose Insulation Ltd.
Edmonton, Alta.

Readers should keep in mind that the writer is refering to the relative air resistance of cellulose insulations compared to other loose fill or fibre insulations. While CFI provides some resistance to air flow, a proper air barrier should still be incorporated.

Our comments on the R-values of various insulation products was based in on information obtained by tests at the National Research Council. The results allow for some interpretation, but they underline the importance of proper installation practices. This was the main point we were trying to get across.

Sir,

We would like to draw your attention to an error that has caused some reflection in our marketing in B.C. (New products: Motorized Fresh Air Dampers, SOLPLAN REVIEW #5).

Our ACA-PAC motorized combustion air damper has always been accepted for use in B.C. since it was approved by the Canadian Gas Association, contrary to your comments.

A. Hoyme
Hoyme Manufacturing Ltd.
Camrose, Alta.

## UPDATE: ON THE NEED FOR CONTINUED SUPPORT FOR THE R-2000 PROGRAM

The LEBCO commentary in the last issue discussed the need for continued support to the R-2000 Program, to encourage the development of second generation technology.

We are informed by Charles Ficner, the director of the Super Energy Efficient Housing program of the Ministry of Energy Mines and Resources that the total funds committed have not been reduced, despite appearances. Rather, what has happened is that the $50 million allocated to the program have been spread among several groups (such as the HRAI, ORF, etc), rather than all being handled by the CHBA. Thus the $18.8 million contract should not be seen as a cutback to the R-2000 program.

Ficner indicated that EMR is maintaining its committment to the R-2000 program.

## VENTILATION: HOW MUCH IS ENOUGH? FICNER REPLIES

In the last issue we raised some questions about just how much ventilation is required to maintain safe and confortable indoor conditions. We raised the questions as a result of the new technical criteria that are now coming into force in the R-2000 program which are based on current ASHRAE standards. It is our opinion that the new ventilation requirements may be excessive.

Charles Ficner of Energy Mines and Resources advises us that for the moment they are relying on ASHRAE standards as they are an accepted recognized standard. He states that EMR felt they had no option but to stick with recognized standards. EMR was not prepared to create entirely new criteria at this time. Instead, they are sticking with what is recognized to be the best available standards. They would prefer to be overly cautious, to avoid any potential problems in the future.

The UFFI disaster has not been forgotten!

Ficner points out that R-2000 houses have been challenged by some as being too tight.

In supporting the R-2000 program, EMR is interested in improving the quality of Canadian housing, without challenge. He points out that R-2000 houses intially started with requirements exceeding ASHRAE standards, but as a result of monitoring activity and field experience, they are moving back down.

They see it as an evolutionary, and not a static program. He pointed out that for administrative reasons program requirements may have to be frozen, but they are constantly being reviewed and are subject to change as the need arises.

Still unanswered is the question of how ASHRAE sets ventilation levels, and how appropriate they may be. Are they suitable standards for Canadian homes?

## NEW PRODUCTS:

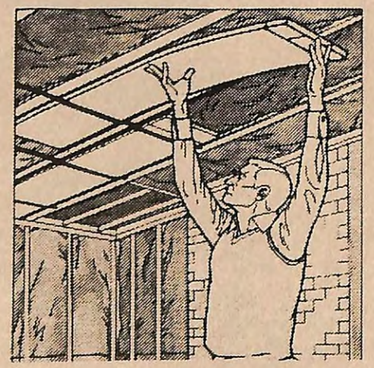
### THERMA-RAY RADIANT HEATING

Recently new thin-film electric radiant heating systems have started to be marketed aggressively. These all share the benefits of radiant heating systems: draft free that have an even heat distribution, have individual area control, and are invisible (ie. no registers, vents or baseboards).

An alternative type of low temperature electric radiant heating panel is being marketed under the Therma-Ray trade name.

The Therma-Ray panel consists of gypsum board with grooves sawn into one surface and covered with plaster to hold them in place. The surface is then covered with heavy paper to provide strength and abrasion resistance. The heating cable is connected to cold leads (i.e. non-heating, insulated wire) within the gypsum board, and only the cold leads protrude from the panel.

The panels are installed between joists or trusses. They are not stapled to the bottom of the joists or trusses, but are held up in place by thin strapping stapled across the bottom of joists or trusses. The panels can be installed between wood strapping nailed across the joists, in which case the panels are nailed or screwed to the ceiling joists, avoiding the cables.



Heating capacity is determined by the heating capability of the panel, which is a function of its size and watt density. Standard panels are available in 9", 12" and 18" widths, in lengths up to 10 feet. Watt density ranges from 21.3 W/ft to 23.3 W/ft .

The panels are safe, as the heating cable is completely embedded in non-combustible gypsum board.

The panels are easy to install, simply being placed between ceiling joists or strapping prior to applying the ceiling. If the ceiling space is accessible from above, they can even be applied from above. This may of interest in retrofit situations.

Because the panels have a high density, they are not as easily damaged as thin films can be. However, the panels are heavy (6 to 30 pounds per panel, depending on size).

As with other radiant systems, they are more expensive than baseboard electric heaters, and it is necessary to insulate above the heating panel if it is between floors.

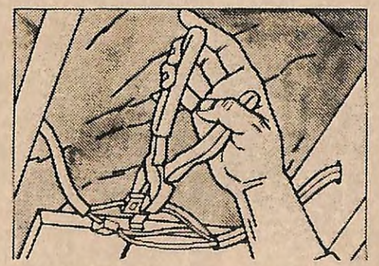
Recently we have heard about complaints that low temperature electric radiant systems are much more expensive to operate than predicted. We suspect that it is necessary to increase the insulation level above that normaly used in the ceiling.

Therma-Ray panels are also available for installation in the floor. These are not the same as ceiling panels, so they are not interchangable.

Therma-Ray panels are CSA approved.

Manufactured by:
Can-Ray Inc.
255 Restigouche Rd.
Oromocto N.B. E2V 2G9
(506)-357-9811

Western Distributor:
Sunradiant Heat International Inc.
10 -11171 Horseshoe Way
Richmond B.C. V7A 4S5
(604)-271-3223





## LEBCO NEWS

### WHY LEBCO?

The Canadian Homebuilders Association (CHBA), administers the R-2000 program; the National Energy Conservation Association (NECA), is the insulation contractors trade organization; the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) is for the engineers and heating trades; the Heating Refrigerating and Air Conditioning Institute (HRAI) is the trade group for the heating trades; and how many other similar trade and interest groups are there in Canada and the USA? Is there a need for yet another organization in the construction/low energy field?

The answer, is YES. There is no organization that is exclusively devoted to the development, analysis and dissemination of impartial information relating to the design and construction of low energy buildings.

We recognize that the multiplication of organizations and societies could mean a duplication of effort. However, as we look at the various players involved in the low energy field we see that many are very select groups, serving the needs of narrow interest groups.

The priority of trade organizations is to look after the commercial interests of their members. As they are directly connected to bread and butter interests, they cannot always distance themselves from a narrow focus to provide an impartial analysis of technical concerns.

As we look at the various organizations out there, there is no one group that brings together the many players involved in low energy building - the builders, designers, researchers, product manufacturers, and even consumers. LEBCO is meant to be a meeting ground where the many participants in the low energy field can meet and exchange their concerns and new ideas without the biases and pressures of narrow commercial interest.

A number of people in the field have felt the need for such a Canadian organization for some time. This does not reflect a narrow nationalistic streak, but a recognition that many issues in low energy building are political as well as technical. (Standards, codes, etc. are politicial creations.)

As a national organization, communication problems can be expected. These can be overcome, and there is much that we can learn from others, living in other climatic regions across the country.

The aims of LEBCO are:

1. To provide a forum for persons and organizations involved in the research, design and construction of low energy buildings in Canada.
2. To promote the interests of the low energy building industry to the public, educational institutes, government and related industries through communication and education.
3. To monitor and evaluate the effects of low energy building technology upon social, technical, economic, and industrial development in Canada.
4. To develop and disseminate information about low energy building to members, government officials and the public.
5. To represent the industry in matters concerning standards, codes, government policy.

Why is LEBCO a part of the Solar Energy Society (SESCI)? A natural progression of research and development work in passive solar energy activity has been activity in low energy building and energy conservation. Many SESCI members have been involved in the field for some time now.

The 1986 SESCI annual conference in Winnipeg has offered LEBCO the opportunity to organize the first technical meeting, which is focusing on a number of issues of specific interest to low energy builders.

Anyone involved with low energy building, whether they are an R-2000 builder, architect, designer, manufacturer, building science researcher, or otherwise involved in the field should join LEBCO today.

A report on presentations in Winnipeg will be made in future issues of SOLPLAN REVIEW. Proceedings of the conference, containing the technical papers presented will be available from SESCI after the conference.

## NEW PUBLICATION

Hard To Find Energy Conserving Products Catalogue: A B.C. Source list.

A 1986 updated version of this useful list has just been published by the B.C. office of Energy Mines Resources Canada. This is a listing of retailers throughout British Columbia handling over 30 energy conserving products, which are often hard to find.

It includes coverage of framing and structural materials, insulation products, air/vapour barriers., specialty sealing products, and a variety of miscelaneous items which include HRVs, duct insulations, controls, and specialty grills and diffusers.

Copies are available (free of charge) from Energy Mines and Resources. Call 666-5949 (outside the Vancouver calling area, toll free number is 1-800-663-1280).

This is the kind of publication that every regional EMR office should be publishing for their region.

NEW NAME FOR DBR

The Division of Building Research at the National Research Council is no more.

No, the Division was not axed in a cost cutting exercise. Rather, it has been renamed the Institute for Research in Construction (IRC). The name change is intended to reflect the current range of activities and priorities of the Institute and its association with the industry.

IRC Director George Seaden, commenting on the change, said "our name may have changed, but our proud tradition of excellence in research and of service to the Canadian construction industry will continue."

At a time of limited financial resources, when budgets for significant research and development assistance are being cut, we don't see how the costs involved with the name change can be justified. Wouldn't it be better to devote the money and energy to a more productive use? After all, "a rose by any other name will smell just as sweet."


## SUBSCRIBE TODAY!

solplan review

Please enter a 1 year subscription to SOLPLAN REVIEW at $24.00 per year.

STUDENTS:
Student subscription rate: $12.00 per year available to full time students. Proof of student status required. Oders must be prepaid.

Payment enclosed

Please bill us

Please charge to my credit card:

VISA MASTER CARD AMERICAN EXPRESS

Expiry date:

Card Number:

NAME: _____

ADDRESS: _____

_____

POST CODE _____

**the drawing-room graphic services ltd.**
box 86627 north vancouver b.c. V7L 4L2

Cover-tech
manufacturers of swimming pool blankets

**COVER TECHNOLOGY INC.**
1269 HOWE ST. VANCOUVER, B.C. V6Z 1R3
TEL. (604) 689-3686

*Energy Efficient Building*
*Consulting Service*
*HOTCAN analysis*
*Design & consulting*

richard kadulski architect
b.a., b.arch., m.a.i.b.c.
1269 howe st. vancouver, b.c. v6z 1r3
telephone: (604) 689-1841

*climate adapted & energy sensitive design*